Light to Sound Using an Arduino Board

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Abstract

The goal of this project is to make a device that detects color and outputs a corresponding sound. The way this is done is by connecting an RGB color sensor and an 8 ohms speaker to an Arduino board and creating a program that connects the two through the Arduino programming interface.
The program converts the wavelength of the color that is being received through the color sensor to a frequency that corresponds to it and then outputs that frequency.

Introduction

The Arduino language (similar to C) was used to make the program. The program consists of a three sections in which the color sensor is to read the RGB value, and a section where the value is then turned into it's
First the color sensor is to read the RGB value and then convert the output number back to an RGB value. Second the RGB value is converted into a designated frequency. Finally the 8ohms speaker outputs the frequency, thus creating sound for the color the device has registered.
Color is the visible light of the electromagnetic spectrum. In the spectrum, light is measured by the two successive peaks of the light's wave, or lambda. The of measurement used it nanometers and the visible spectrum ranges from 400-700nm. Sound is Hertz, which is a unit of frequency. Humans are able to hear from about 20-2000Hz.
For the device these values were taken into account during the conversions. Shown in.

Color Sensor Code

```
void TCS()
{
 digitalWrite(s1,HIGH);
 digitalWrite(s0,LOW);
 flag=0;
 attachInterrupt(0, ISR_INTO, CHANGE);
 timer2_init();
}
...
else if(flag==2)
 {
  digitalWrite(s2,LOW);
  digitalWrite(s3,LOW);
  countR=counter/1.051;
  Serial.print("red=");
  Serial.println(countR,DEC);
  digitalWrite(s2,HIGH);
  digitalWrite(s3,HIGH);
 }
...
void loop()
{
delay(10);
TCS();
if((countR>10)||(countG>10)||(countB>10))
 {
   if((countR>countG)&&(countR>countB))
    {
       Serial.print("red");
       Serial.print("\n");
       delay(1000);
    }
 ...
```

Data Used to Convert Color to Sound

$R = red\ level$ $\quad \lambda_{Red} = 645$
$G = green\ level$ $\quad \lambda_{Green} = 542$
$B = blue\ level$ $\quad \lambda_{Blue} = 460$

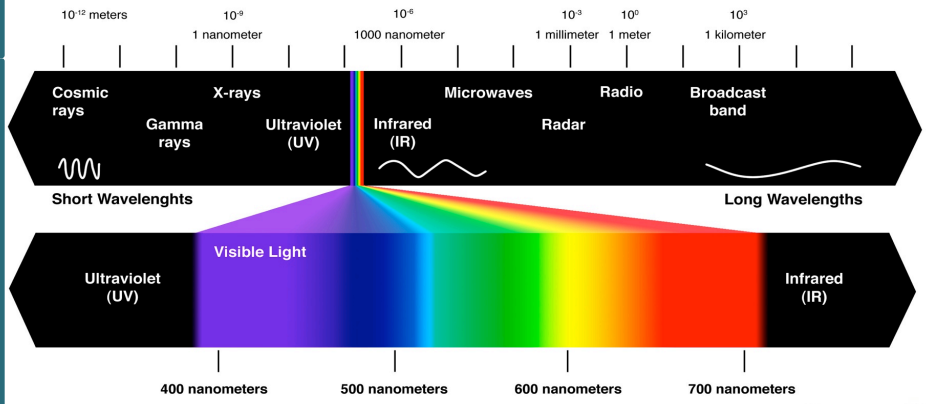
$$\lambda_{ave} = \frac{R\lambda_R + G\lambda_G + B\lambda_B}{R + G + B}$$

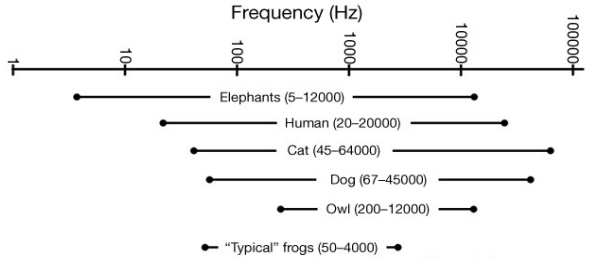
$\lambda_{min} = 350nm$ $\quad \lambda_{max} = 700nm$

$F_{min} = 600Hz$ $\quad F_{max} = 20{,}000Hz$

$$\frac{F}{\lambda} = slope = \frac{F_{max} - F_{min}}{\lambda_{max} - \lambda_{max}} = \frac{19940Hz}{350nm}$$

$$F_{ave} - \lambda_{ave}\, w$$





Materials For Experiment

- Arduino Mega 2560
- USB A to B cable
- Single connector cables
- 8 ohms speaker
- RGB Color Sensor

References

"Language Reference." Arduino. N.p., n.d. Web. 10 Mar. 2013. <http://arduino.cc/en/Reference/HomePage>.

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